1.05 – The Drifter

Jacob Smith, Amber Ferguson, Rod Michael, Rudy Montero

TEXAS STATE UNIVERSITY
The rising STAR of Texas

Jacobs

Project Overview

The Drifter is a low-maintenance, low-cost datalogging smart buoy. The system will be powered through a solar panel, with a rechargeable backup battery for night cycles and less than ideal weather. It will log various water quality metrics and store the data locally on a microSD card and display the current readings on an e-Ink display on top of the enclosure. The user can access this data wirelessly using Bluetooth or Long-Range Signals without ever having to remove The Drifter from the water.

Business Need

NASA's Earth Science & Remote Sensing (ESRS) Unit will use the data provided by The Drifter to help refine data collected by NASA satellites and aircraft and improve the accuracy of NASA models and forecasts.

The Drifter will also be used as an entry level kit to introduce high school students to the world of data logging and water monitoring projects.

Requirements

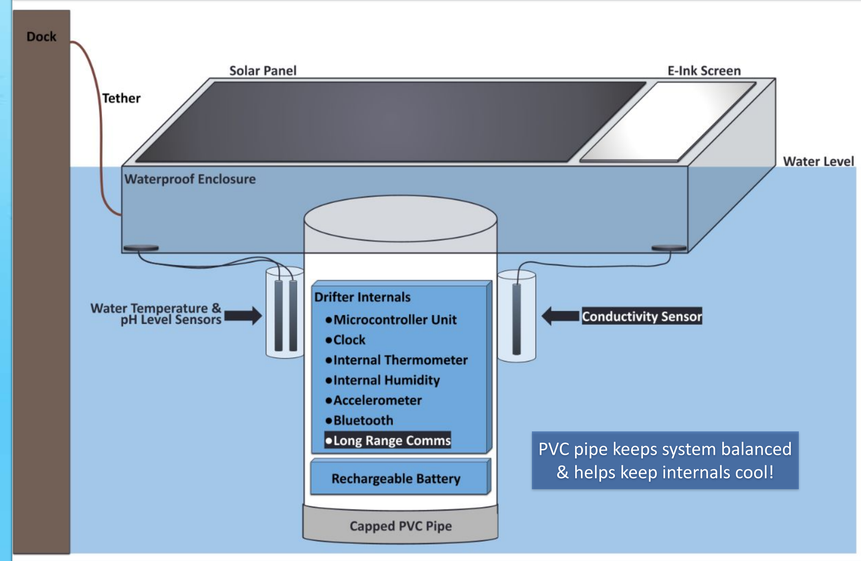
Features

- Self-sufficient Solar Power System
- Water Sensing Ability
  - Temperature
  - pH Level
  - Conductivity
  - Total Dissolved Solids (TDS)
  - Salinity
- E-Ink Display
- Data Saved to microSD card
- Wireless access to Data
  - Bluetooth
  - Long Range (LoRa) Signal

Performance Criteria

- Build option under $100
- 12-month deployment
- Waterproof & Buoyant
- 30-minute sampling frequency
- Off-the-shelf Construction
- Easy data retrieval

Initial Design Overview



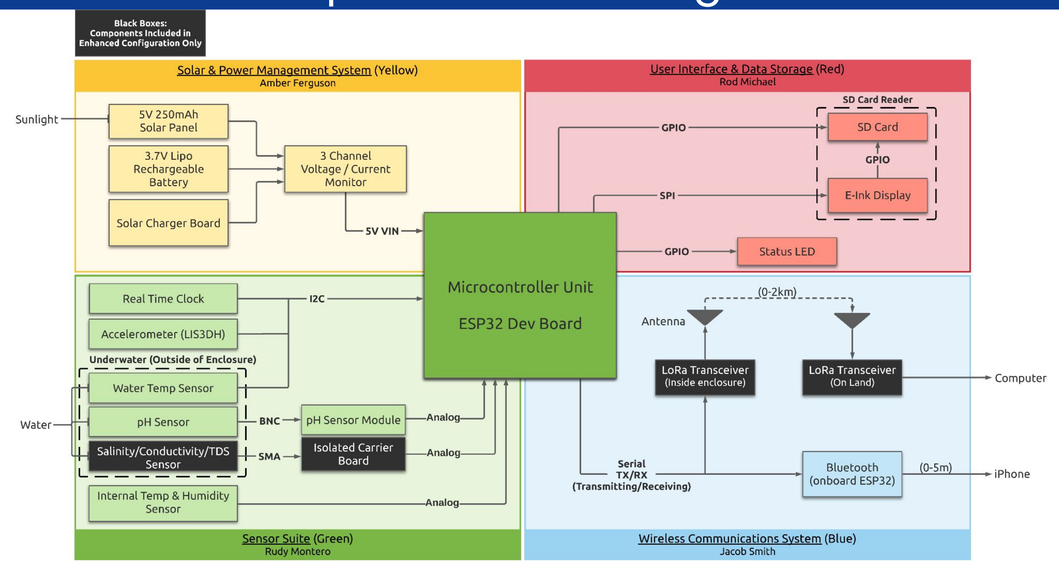
Base Configuration: $99

- Under $100 Budget
- Short Range Comms: Bluetooth
- Sensor Suite
  - Internal & External Temp
  - Internal Humidity
  - pH Level
  - Accelerometer

Enhanced Configuration: $250

- Long Range (LoRa) Comms
- Adds Sensor for:
  - Salinity / Conductivity / TDS

Top Level Block Diagram



Power Budget Estimation

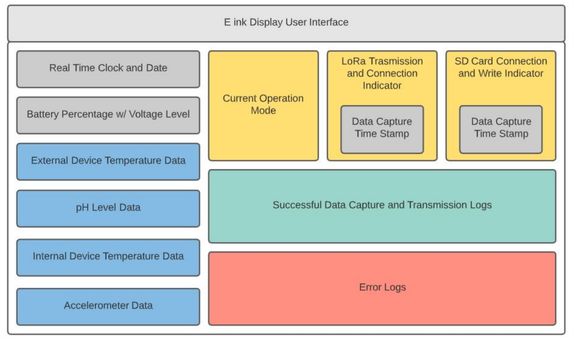
	Sleep Mode		Active Mode	
Subsystem	Current (A)	Power (W)	Current (A)	Power (W)
MCU & Sensors	23.45	95.75	123	0.58
Comms	0.02	0.07	246	0.81
UI & Storage	0.01	0.02	140	0.46
Base Config	**0.01**	**0.06**	**0.23**	**0.93**
Enhanced Config	**0.02**	**0.10**	**0.24**	**0.98**

Estimated Power Consumption Per 30 Min Cycle

State	Power (mWh)	Time	Power (mW)
Sleep	96	27 min	43.2
Active	928	3 min	46.4
Bluetooth Spike	446	100 ms	0.012
SD Writing Spike	66	100 ms	0.002
Estimated Power Per 30 Min Cycle			**0.89 W**
Total Estimated Power Per Day			**4.30 W**

Drifter Team

User Interface



Results to Date

- Parts Ordered
- Power Budget Drawn
- Power Subsystem wired, & initial testing started.
- E-Ink Display wired, & initial testing started.
- Sensor Functionality Tested

Next Semester Actions

- Unit Testing and Analysis
- Full Integration of System
- 4-Week Deployment Test in Water
- Fully Documented User Manual

Acknowledgements

Faculty Advisor: Lee Hinkle

Sponsor: Andrea Wenzel Jacobs/NASA's ESRS

Earth Science & Remote Sensing Unit